Claims

1. A network arrangement comprising nodes and optical links interconnecting the nodes, characterized in that at least one node comprises:

a transceiver pool that includes at least one transceiver, at least one customer-side (CS) connection point, and at least one optical director-side (ODS) connection point, where the transceiver pool is adapted to couple said at least one CS connection point to said at least one ODS connection point so that information contained in a signal of a particular wavelength at said ODS connection point is substantially the same as information contained in said coupled CS connection point, where said particular wavelength is specified by a control signal; and

an optical director element adapted to communicate information via essentially all-optical paths, said director having a number of ports at least one greater than the number of said ODS connection points, and having said ODS connection points connected to a corresponding number of said ports, where the optical director is controllable to send any part of a signal applied to any one of its ports to any other of its ports.

2. The network of claim **1** where each of said links interconnects a pair of nodes and comprise a series connection of at least one optical cable that contains at least one optical fiber.

3. The network of claim **1** where said optical director forms a communication channel between one or more of said ODS connection points and output ports of said optical director that are not connected to said ODS connection points.

4. The network of claim **1** where the number of said CS connection points is equal to number of said ODS connection points.

5. The network of claim **1** where each transceiver in said transceiver pool is adapted to deliver to said CS connection points an optical signal that is suitable for long-reach optical transmission.

6. The network of claim **1** where each transceiver in said transceiver pool is connected to one of said CS connection points, and to one of said ODS connection points.

7. The network of claim **1** further comprising a service layer device that is coupled to the CS connection points.

8. The network of claim **1** where said transceiver pool is part of a service layer device.

9. The network of claim **8** where said service layer device performs a routing, or a multiplexing function.

10. The transceiver pool of claim **1** where a transceiver element in said pool is adapted to transfer information contained in a signal at a CS connection point to a signal of a particular wavelength at an ODS connection point.

11. The transceiver element of claim **10** where the signal at its associated CS connection point is electrical.

12. The transceiver element of claim **10** where the signal at its associated CS connection point is optical.

13. The network of claim **1** where a transceiver element in said pool is adapted to transfer information to a CS connection point that is contained in a signal of a particular wavelength appearing at one of said at least one OD connection point.

14. The transceiver of claim **13** where the signal at the CS connection point is electrical.

15. The network of claim **1** where said optical director comprises

a switch connected to said ODS connection points; and

an optical director connected to said switch and to those ports of said optical director that are not connected to said transceiver pool.

16. The network of claim **1** further comprising a management network for communicating said control signals.

17. The network of claim **16** where the management network is distinct from said network.

18. The network of claim **1** further including in-band control signals that flow through said network to provision nodes of said network.

19. The network of claim **1** further including out-of-band control signals that flow through said network to provision nodes of said network.

20. The network of claim **1** where said transceiver pool is embedded in said optical director.

21. A method for provisioning capacity in a network where nodes are interconnected with optical links comprising the steps of:

at a first node of said nodes

receiving control signals;

responsive to said control signals, tuning a first transceiver pool to deliver an information-bearing signal at one of N ODS connection points associated with said first transceiver pool (local ports), where N is a non-zero integer, and to accept an information-bearing signal from said corresponding ODS connection point, where said

information-bearing signal that is delivered by said first transceiver pool is at a wavelength specified by said control signals, and information in said information-bearing signal delivered by said transceiver pool is substantially the same as information provided to said transceiver pool from a CS connection point; and

responsive to said control signals, directing a first optical director having at least N+2 ports, with N ports associated with said N ODS connection points associated with said first transceiver pool, and remaining ports being coupled to selected ones of said optical links (long-reach ports), to route signals arriving at said N ODS connection points to specific ports of said first optical director.

22. The method of claim **21** where said signal delivered by said transceiver pool is adapted for long-reach transmission.

23. The method of claim **21** where said directing of routing to specific ports of said optical director is limited to routing to said long-reach ports.

24. The method of claim **21** where said control signals also cause said optical director to deliver signals arriving at said long-reach ports to said transceiver pool.

25. The method of claim **21** further comprising the steps of:

at another node of said network,

receiving control signals;

responsive to said control signals, directing a second optical director that has M ODS connection points and at least 2 ports, where M is a non-zero integer, to route signals arriving at one of said ports to one of said M ODS connection points, as specified by said control signals; and

responsive to said control signals, tuning a second transceiver pool to accept an information-bearing signal at one of said M ODS connection points for delivery to one of a plurality of CS connection points associated with said second transceiver pool.

26. A method for controlling a network that includes nodes, and links that interconnect the nodes, where a first node of the nodes executes a process comprising the steps of:

provisioning a tunable transceiver of said first node to communicate substantially all of the information of an applied customer signal to a first local connection point that is coupled to a first controllable optical director of said first node, which information is modulated onto a wavelength specified by a control signal applied to said tunable transceiver; and

provisioning said first controllable optical director to transfer signals at said first local connection point that have said specified wavelength to a port of said first controllable optical director that is specified by a control signal applied to said first optical director, said transfer being via essentially all-optical communication paths within said first controllable optical director.

27. The method of claim **26** where the communication paths of the optical director are all-optical.

28. The method of claim **26** where the port selected for said controllable optical director is connected to a link that is coupled to a port of a second node of said nodes, where said second node executes a process comprising the steps of:

provisioning a second controllable optical director to transfer signals that appear at said port of said second node and have said wavelength to a local connection point of said second node, said transfer being effected via essentially all-optical paths in said second controllable director; and

provisioning a tunable transceiver of said second node to form an output signal from a signal that appears at said local connection point of said second node and at said wavelength.

29. The method of claim **28** where the second controllable optical director transfers signals via an all-optical path.

30. The method of claim **26** where the control signals are applied to said first node in response to a request for provisioning.

31. The method of claim **30** where the request is initiated by an element of the node.

32. The method of claim **30** where the request is initiated by a customer.

33. The method of claim **30** where the request arrives from another node.

34. The method of claim **30** where the request arrives from an administrator that has direct control over provisioning of the node.

35. The method of claim **30** where the request arrives from an entity that has management control over the network.

36. The method of claim **35** where the request arrives from said entity pursuant to a process that rearranges provisioning in said network.

37. The method of claim **35** where the rearranging of provisioning is in response to a request by a customer to provide a modified capacity allocation.

38. The method of claim **35** where the rearranging of provisioning is in response to changes in network load conditions.

39. The method of claim **38** where the changes in network load conditions arise from network faults.

40. The method of claim **26** where the control signals are applied in response to a fault condition detected in the network.

41. A method for controlling a network that includes nodes, and links that interconnect the nodes, where a node of said nodes, which comprises a traffic element that includes a tunable transceiver that is coupled to at least one local port of a controllable optical director that includes at least two non-local ports, executes a process comprising the steps of:

provisioning said controllable optical director to transfer signals of wavelength X that arrive at a first of said non-local ports, to local port A of said local ports,

provisioning said controllable optical director to transfer signals of wavelength Y from local port B of said local ports to a second of said non-local ports;

provisioning said tunable transceiver to regenerate information contained in signals of wavelength X that arrive at said local port A; and

provisioning said tunable transceiver to develop signals at said local port B that have wavelength Y and carry substantially the regenerated information.

42. The method of claim **41** where wavelength X and wavelength Y are one and the same wavelength.

43. The method of claim **41** where wavelength X and wavelength Y are different from each other.

44. The method of claim **43** where said local port A and said local port B are one and the same local port.

45. The method of claim **41** where said local port A and said local port B are different from each other.